

Gulf Coast Pipeline Project 2012

Pipeline Construction Overview

Keys to pipeline construction



- **Planning**

- Good route selection
- Open and clear communication with impacted landowners
- Engineering and design
- Impact analysis
- Agency consultations
- Surveys

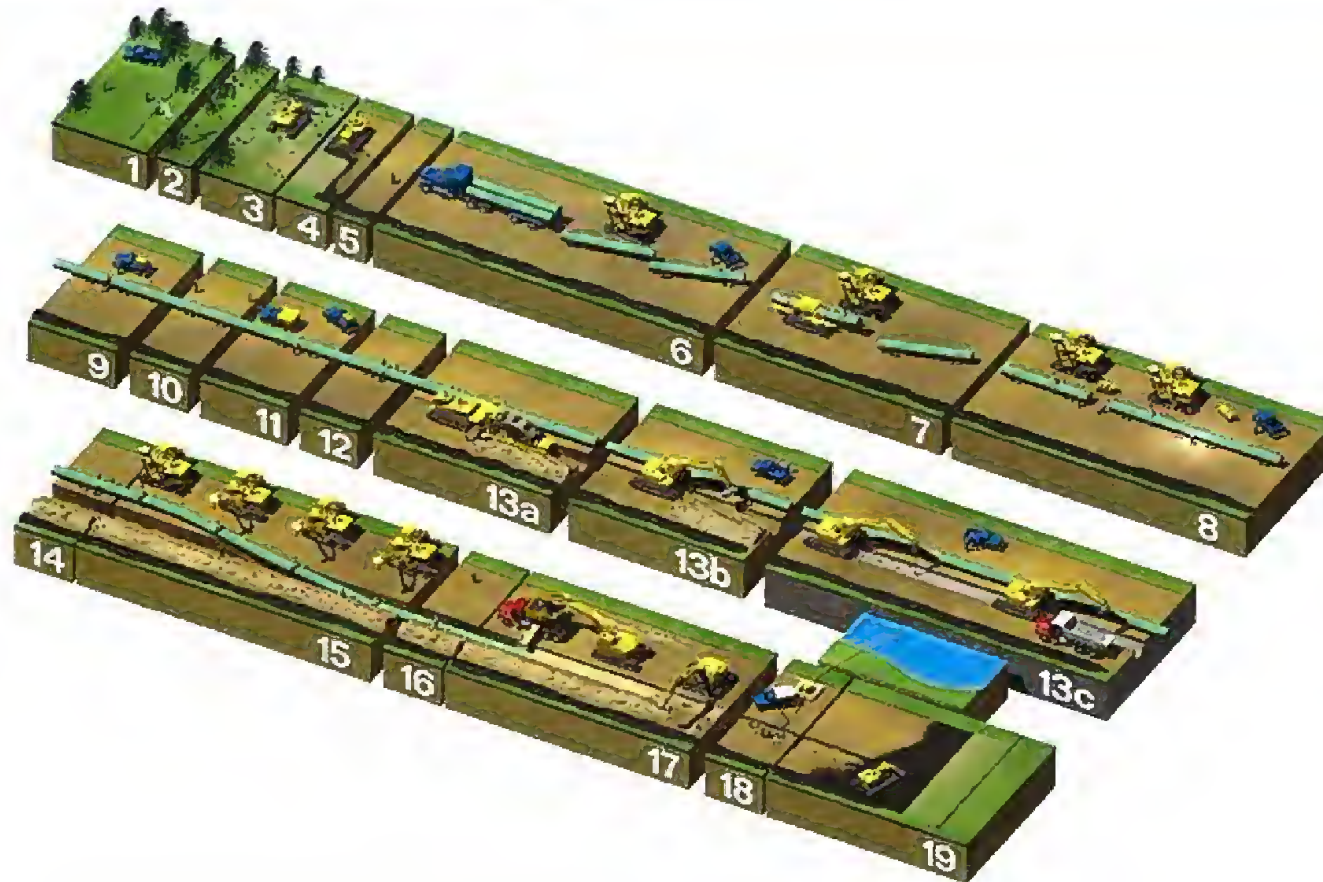
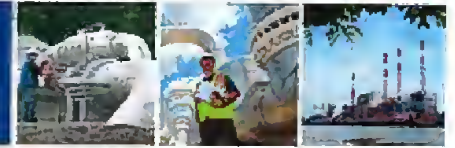
- **Construction**

- Minimize impacts
- Focus on most sensitive areas

- **Restoration**

- Immediate steps improve long-term prospects
- Successful restoration means returning the land to pre-construction conditions

Pipeline Construction Overview



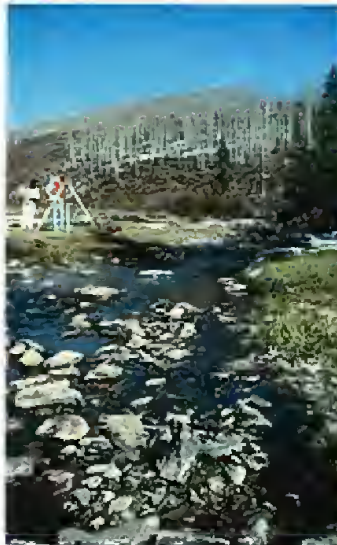
1. Survey and staking
2. Clearing
3. Front-end grading
4. Topsoil stripping
5. Centerline staking
6. Stringing pipe
7. Field-bending pipe
8. Line-up, initial weld
9. Fill-and-cap, final weld
10. As-built footage
11. X ray inspection, weld repair
12. Coating field welds
13. (a) Trenching (wheel ditcher)
(b) Trenching (rock)
(c) Trenching (backhoe)
14. Inspection and repair of coating
15. Lowering pipe into trench
16. As-built survey
17. Pad, backfill, rough grade
18. Hydrostatic testing, rough grade
19. Replace topsoil, final clean-up, full restoration

Graphic courtesy of Natural Resources Group, LLC

Staking and Clearing



- Survey crews are generally the first construction workers landowners and the public will encounter.
- Their job is to mark the limits of the pipeline right of way and the location of temporary additional work spaces.



Staking and Clearing, cont.

- GCP is requesting a 50-foot-wide permanent right-of-way for the pipeline and an additional 60 feet of construction workspace. Additional temporary workspace may be requested at certain locations.



Bridging and Matting



- Federal regulations allow pipelines to cross waterbodies a single time without bridges or mats.
- Appropriate bridges or mats are required for all subsequent equipment crossings.
- At top is a rail-car bridge. The picture below shows a span bridge with in-stream supports (culverts).
- All bridges and matting are removed after construction.



Bridging and Matting, cont.

- Timber mats are laid down to protect sensitive wetland. The mats are removed after construction.



Grading



- Grading follows clearing and installation of bridges and matting.
- Grading is necessary to provide a safe work surface for construction equipment.
- Topsoil is carefully segregated and stored during the grading process.



Topsoil Segregation



- Proper topsoil segregation is crucial, especially in agricultural areas.
- Topsoil is graded to a depth of at least 12 inches.



Erosion Control



- Erosion control is another crucial aspect of pipeline construction.
- GCP will employ various methods to control erosion both during and after construction.



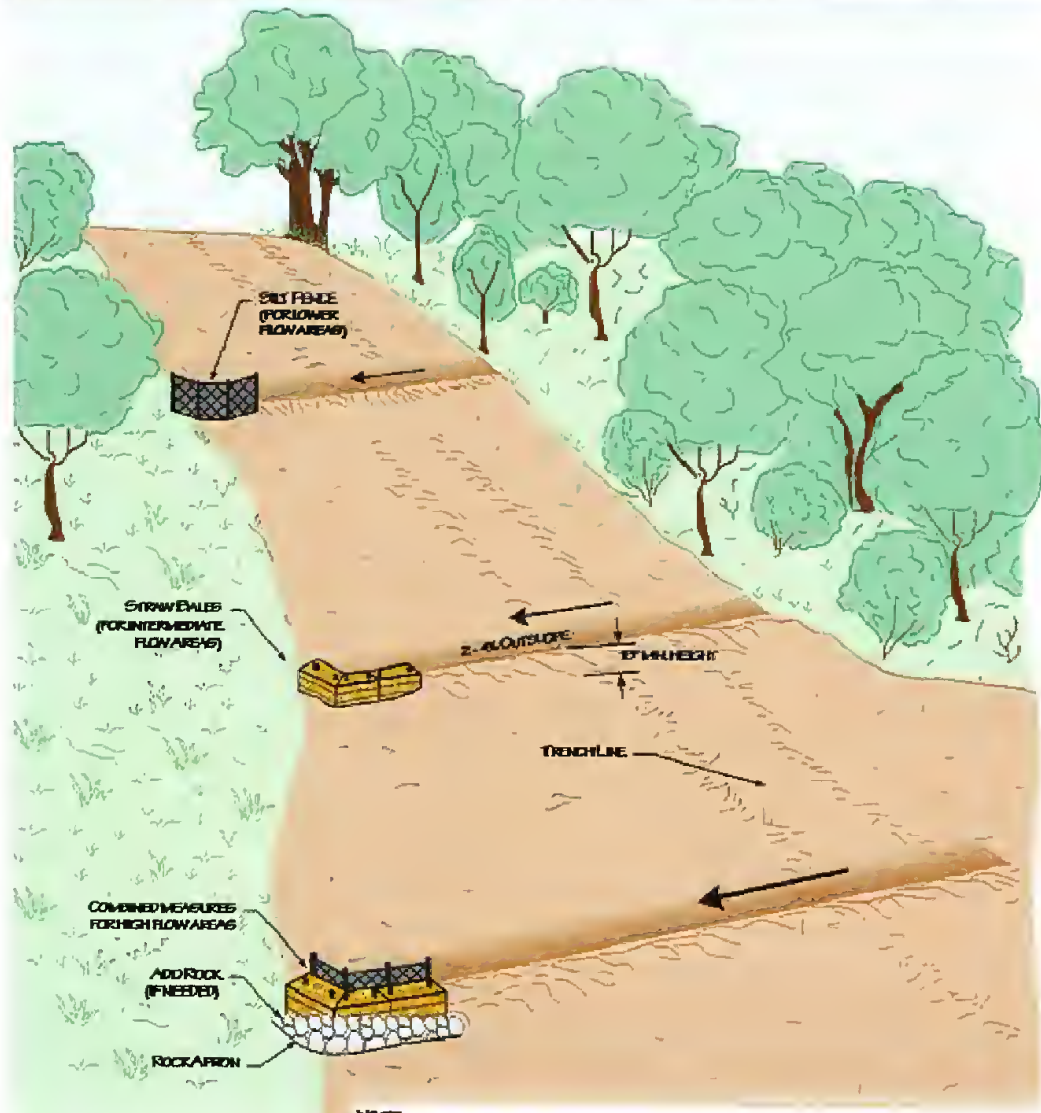
Erosion Control, cont.



- This photo shows erosion controls installed adjacent to a waterbody to prevent sedimentation.
- Both silt fences (the black fences) and hay bales are shown in this photograph.
- The excavated trench is visible at the top of the photo.



Erosion Control, Post-construction



NOTES:

1. WIRE FENCE OR ROCK REINFORCEMENT NEEDED BEHIND SILT FENCE IF WARRANTED.
2. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED IN ACCORDANCE WITH THE COMPANY'S UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN.

- Permanent slope breakers are sometimes installed to divert water off the right-of-way in areas prone to erosion.
- Regulations allow permanent slope breakers to extend slightly off the right-of-way into stable, well vegetated areas.

Stringing



- Stringing is the process of laying the sections of coated pipe end-to-end near where the pipeline will be welded and lowered into the trench.
- The sections of pipe – typically either 40 or 80 feet long – are trucked to the right of way.



Stringing



- Here, the pipe has been strung. In the background, a piece of pipe is being bent to conform to the contours of the trench.



Bending and Welding

- The pipe is bent to conform to ground contours. Most bends can be done in the field. Special bends must be ordered from the factory (e.g., 45- and 90-degree bends).



Bending and Welding, cont.



- Once the pipe is bent as needed, the pipe joints are aligned and welded together.
- Here you can see an alignment tool sticking out of the end of the pipe and a “welding shack” being lowered onto the pipe.
- These shacks contain automated welding machinery which performs the actual welds. All welds on the southernmost section of the Gulf Coast Project will be performed by hand.



Welding Inspection

- Every weld is examined using X ray or ultra-sound technology to check for anomalies that could affect performance or safety. Any defects are fixed and the weld re-tested.



Coating Inspection



- Every section of pipe is “jeeped” to make sure there are no “holidays” or spots where the protective coating is missing or too thin. Those spots are repaired to ensure the integrity of the coating that protects the outside wall of the pipe.



Trenching



- The most common method of excavating the trench for the pipeline is using a backhoe.
- The trench is deep enough to provide at least four feet of cover from the surface to the top of the pipeline.



Lowering In



- Lowering in is performed by specialized equipment called side-booms.
- A series of side-booms work together to pick up and lower a section of pipe into the trench.
- This photo provides a good depiction of the flexibility of steel pipe.



Backfilling

- There are several methods of returning the soil to the trench. One of the more common is to use a backhoe.



Backfilling, cont.



- Prior to backfilling in sloping areas, structures called trench breakers are built around the pipe to prevent ground water from eroding the backfill. The number and location of trench breakers are determined by local conditions and regulation. There are several types of trench breakers.



Backfilling, cont.

- In rocky soils, the backfill soil is sifted to provide finely graded backfill to support and protect the pipe.



Backfilling, cont.



- Once the trench is backfilled, the right-of-way is rough graded to restore pre-construction contours.



Restoring Topsoil



- Once the contours are restored and the subsoil has been “ripped” to make sure the soil was not overly compacted during construction, the topsoil is carefully re-spread across the right-of-way.
- This step is particularly crucial in agricultural areas.



Hydrostatic testing

- Once the pipeline is assembled, lowered-in, and backfilled, the pipeline is pressure tested to verify its integrity. This is typically done with water and is called hydrostatic testing.
- Sections of pipe are filled with water and then brought to a pressure that exceeds the pipeline's maximum allowable operating pressure. Pressure is maintained for several hours to test for leaks.



Restoration



- The goal of restoration is to return the land to its pre-construction condition.



Restoration, cont.

- The right-of-way is reseeded with the appropriate ground cover using a variety of methods. Hand dispersal of seeds is one option. Once seeded, the right-of-way is typically covered with mulch to improve germination.
- In agricultural areas, the land is replanted with the landowner's choice of crop.



Restoration, cont.



- Restoration is typically so successful that pipelines are required to place hundreds of markers on the right-of-way to remind landowners and others of the pipeline's presence.



Restoration, cont.



- The right-of-way is barely visible in this photograph. It curves from the bottom left up a ridge and leaves the frame at upper right.
- Slope breakers are visible at several points on the hill.



Restoration, cont.



- In this photo, parallel 36- and 42-inch diameter pipelines run from the lower left at an angle that extends into the wooded area just above the middle of the photograph on the right.



Restoration, cont.

- Pipeline right-of-way one year after construction.
- Two slope breakers are visible on the hillside.



Restored stream crossing



- Here is the same location a year later.



Restoration, cont.

- A pipeline project shortly after construction . . .



Restoration, cont.



- And the same location a year later.



Restoration



- Pipeline construction does have impacts, but they are typically linear, dispersed, and temporary.



Conclusion



- **TransCanada has extensive experience in pipeline construction, building more than 37,000 miles of long-distance pipeline over the past 50 years**
- **Pipeline construction methods and materials are constantly improving, and TransCanada has voluntarily submitted to additional regulations that will make GCP the safest pipeline ever built.**
- **Pipeline construction is highly regulated and operations are constantly monitored**
- **The philosophy of pipelines during construction is “avoid, minimize, mitigate”**
 - Avoid where possible by good route planning
 - Minimize during construction
 - Mitigate the limited impacts that cannot be avoided